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ABSTRACT

As a part of a series describing participants in the cooperative education option of the technical program at Macomb County Community College, this report compares the academic achievements, demographics, and employment characteristics of a random sample of 63 co-op respondents and 69 non co-op respondents from the original study population. Co-op students were younger the first time they enrolled than non co-op students (an average of 19.9 years old compared to 25 years old). Male co-ops were more apt to be employed in program-related jobs; however, the co-op experience did not have the same effect on the women students. Graduation from the technical program, either co-op or non co-op, had little influence on students' ability to get a program-related job; participation in the co-op option had a greater impact on employment than the fact of graduation. Co-op students completed significantly more technical courses and had higher final grade point averages (GPA). The co-op graduates did not have higher GPA's than the co-op non-graduates, but the non co-op graduates of the technical program had higher final GPA's than the non co-op non-graduates. There was no significant difference in students' GPA before and after the co-op experience. Final GPA's for the co-op students who continued employment with the co-op company were not higher than for those changing place of employment. (MB)

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MACOMB COUNTY COMMUNITY COLLEGE

DEPARTMENT OF RESEARCH

# AN APPRAISAL OF THE INDUSTRIAL COOPERATIVE EDUCATION PROGRAM BASED ON SELECTED CHARACTERISTICS OF THE STUDENTS AND THEIR ACADEMIC PERFORMANCE

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Nancy S. Freeman
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TABLE OF CONTENTS


| Chapter | | Page |
|---|---|---|
| I. | INTRODUCTION | 1 |
| | Summaries of the Previous Reports | 2 |
| | Purpose | 3 |
| | Significance | 4 |
| II. | PROCEDURE | 5 |
| III. | RESULTS | 7 |
| | Response to Question 1 | 7 |
| | Response to Question 2 | 8 |
| | Response to Question 3 | 10 |
| | Response to Question 4 | 11 |
| | Response to Question 5 | 12 |
| | Response to Question 6 | 13 |
| | Response to Question 7 | 13 |
| | Response to Question 8 | 14 |
| | Response to Question 9 | 15 |
| | Response to Question 10 | 16 |
| | Response to Question 11 | 17 |
| IV. | DISCUSSION | 19 |
| V. | SUMMARY | 23 |

LIST OF TABLES


| Table | | Page |
|---|---|---|
| 1. | Analysis of Ages of Co-op and Non Co-op Students When They First Enrolled at MCCC . . . . . | 7 |
| 2. | Chi-Square Test Between Group and Program Related Employment for the Men Students . . . . . | 8 |
| 3. | Chi-Square Test Between Group and Program Related Employment for the Women Students . . . . . | 9 |
| 4. | Test of Independence of Graduation and Program Related Employment for Co-op Students . . . . . | 9 |
| 5. | Test of Independence of Graduation and Program Related Employment for Non Co-op Students . . . . . | 10 |
| 6. | Analysis of the Average Number of Technical Courses Completed at MCCC by the Co-op and Non Co-op Students . . . . . | 11 |
| 7. | Analysis of the Average Number of Credit Hours Earned at MCCC by the Co-op and Non Co-op Students . . . . . | 12 |
| 8. | Analysis of Final G.P.A.'s of Co-op and Non Co-op Students . . . . . | 12 |
| 9. | Analysis of Final G.P.A.'s for Co-op Graduates and Non Graduates . . . . . | 13 |
| 10. | Analysis of Final G.P.A.'s for Non Co-op Graduates and Non Graduates . . . . . | 14 |
| 11. | Analysis of the G.P.A.'s of Co-op Students Before and After the First Co-op Experience (I.C.I. Grades Excluded) . . . . . | 15 |
| 12. | Analysis of the Co-op Students' Final G.P.A.'s With and Without the Seminar Grades . . . . . | 16 |
| 13. | Analysis of Final G.P.A.'s for Students in a Specific Category . . . . . | 17 |

Table Page

14. Description of Co-op Students Using Graduation Status as a Base . . . . . 19

15. Description of Non Co-op Students Using Graduation Status as a Base . . . . . 20

16. Description of Co-op Students Using Program Related Employment as a Base . . . . . 20

17. Description of Non Co-op Students Using Program Related Employment as a Base . . . . . 21

# CHAPTER I

## INTRODUCTION

This report is the final one of a series presenting the results of a study designed to describe participants in the cooperative education option of the technical programs at Macomb. Based on responses to a survey, the co-op students were compared with non co-op students enrolled in the same eighteen technical programs. Several employers also participated by responding to a survey designed to assess their opinions as to the effectiveness of the preparation received by students in Macomb's technical programs. An evaluation of their perceptions of effects of the co-op option on the employee was included.

The first four reports were distributed under the titles:

1. An Appraisal of the Industrial Cooperative Education Program Based on Responses from Students and Employers
   Date: October 14, 1977

2. An Appraisal of the Industrial Cooperative Education Program Based on Responses from Students and Employers: Supplemental Report Number 1, The Design Technology Programs
   Date: November 28, 1977

3. An Appraisal of the Industrial Cooperative Education Programs Based on Responses from Students and Employers: Supplemental Report Number 2, The Mechanical Technology Programs
   Date: January 10, 1978

4. An Appraisal of the Industrial Cooperative Education Program Based on Responses from Students and Employers: Supplemental Report Number 3, The Women Students
   Date: January 13, 1978

Summaries of the Previous Reports

A brief summary of the previous reports is included to provide some background for this particular aspect of the series.

The first report included a detailed description of the procedures followed and provided copies of all forms and letters used to conduct the study. The key results showed that students who had the co-op experience were more likely than non co-op students to:

1. have full-time program related jobs
2. experience a lower unemployment rate
3. complete their college programs
4. satisfy their reasons for enrolling at MCCC
5. perceive the preparation received at MCCC as favorable
6. be considered more efficient by employers
7. learn more quickly on the job
8. understand the company organization better.

The Design Technology programs were reported as a group and then individually. These are hereafter referred to as the design group and the program groups, respectively. The data in the report tend to be favorable to the Auto Body Design Program and the Tool Fixture and Die Design Program. The co-op group from the Auto Body Design Program reported more favorable ratings and percentages on almost every item when compared with the entire design co-op group. The Tool Fixture and Die Design Program co-ops and non co-ops reported generally more favorable percentages than the other design groups.

The format of the Mechanical Technology Program report paralleled the previous one. The students in the Mechanical Technology Programs varied from the total groups in the first report in:

1. that 9 percent more of the mechanical co-op group hold program related jobs than do co-ops from the total group

2. that the mechanical co-op group has a 2 percent higher unemployment rate than does the total co-op group

3. that the mechanical non co-op group has a 12 percent higher graduation rate than the total non co-op group

4. that the mechanical groups receive higher salaries than do the total groups.

Two differences between the mechanical co-ops and non co-ops are sufficient to warrant restatement here. They are:

1. that 18 percent more of the mechanical co-ops graduated than did the mechanical non co-ops

2. that almost 14 percent more of the mechanical co-ops hold program related jobs than do the mechanical non co-ops

The report on the Women Students found among other salient facts:

1. that co-op women tend to be graduates and to hold program related jobs

2. that more non co-op women are unemployed than are co-op women

3. that 11 percent more women than men who have been students are unemployed

4. that 41 percent of the women respondents were enrolled in the Graphic & Commercial Art program.

## Purpose

This study was conducted to compare co-op students and non co-op students on the bases of their respective academic achievements and other selected characteristics. Statistical analyses of data were employed to determine answers to the following questions:

1. Is there a significant difference in the average age of co-op and non co-op students the first time they enrolled at MCCC?

2. Are former co-op students more apt to be employed in program related jobs than are former non co-op students?

3. Do co-op students complete more technical courses at MCCC than non co-op students?

4. Do co-op students earn more credit hours at MCCC than do non co-op students?

5. Do co-op students have a significantly higher final grade point average (G.P.A.) than non co-op students?

6. Do the co-op graduates have a significantly higher final G.P.A. than the co-op non graduates?

7. Do the non co-op graduates have significantly higher final G.P.A. than the non co-op non graduates?

8. Is there a significant difference in the G.P.A before and after the co-op experience for the co-op student?

9. Do the grades received in the co-op seminar course significantly influence the final G.P.A.?

10. Are final G.P.A.'s for co-op students who continued employment with the co-op company significantly higher than the final G.P.A. for those who changed the place of their employment?

11. Are there any significant differences between the respondents of the first and second mailings of the survey instrument?

## Significance

The first report of the series was based on the perceptions and other survey responses given by the students. This report relied on the student records for data. Using grades, credit hours earned, number of technical courses completed and other data as variables, significant differences between co-op and non co-op students surfaced. Therefore, this report completes the investigation designed to appraise the co-op education option of the Industrial Technology Programs at the College.

## CHAPTER II

## PROCEDURE

The population for this study was the 252 co-op respondents and the 274 non co-op respondents from the main study. In order to handle the statistical analyses efficiently, a random sample of the total population was selected. Transcripts were retrieved for each of the 63 co-op students and 69 non co-op students included in this study.

An academic performance matrix was designed using the following information taken from or calculated from the transcripts and extracted from the data used in the main study:

1. Group - co-op or non co-op
2. Sex - male or female
3. Age - first time enrolled rounded to the nearest year
4. Number of credit hours attempted
5. Number of hours earned
6. Final grade point average (G.P.A.)
7. Total number of technical courses--sum of courses completed with grades of A, B, C, D, E and having section numbers assigned to the Design and Mechanical Technology programs and excluding the co-op seminar courses.
8. Graduation - yes, no, or unknown
9. Employed - yes, no, not seeking, or unknown
10. Employed in a program related job - yes, no, or not known
11. Responded to first or second mailing
12. Number of technical courses completed before the first co-op assignment
13. Number of credit hours completed before the first co-op assignment

14. G.P.A. of all courses with grades of A, B, C, D, or E completed before the first co-op assignment

15. G.P.A. of all courses with grades of A, B, C, D, or E completed after the first co-op assignment excluding the grades of co-op seminar course

16. G.P.A. of all courses with grades of A, B, C, D, or E except the co-op seminar

17. G.P.A. of co-op seminar courses

18. Number of credit hours of co-op seminar

19. Number of semesters with a co-op assignment

The entire list of 19 items was provided for the co-op student group. Items from one to 13 were determined for the non co-op group; the others do not apply.

The data analyses were conducted by computer. The following descriptive statistics were calculated for various items on the matrix:

1. minimum value
2. maximum value
3. mean
4. standard deviation
5. frequency counts
6. percentages

In order to determine any statistical significance between the values obtained by both groups in various categories, the Student t-Test was used. The same test was also employed to discover significant differences, if any, of the values in various categories within the co-op group. The Chi-Square ($\chi^2$) test of significance was used to discover differences in the frequency counts of some categories for the co-op and non co-op groups. The various manipulations of the data produced the results presented in the following chapter.

# CHAPTER III

## RESULTS

This chapter presents the results of the statistical analyses of the data gathered on the student samples. Each question is stated followed by a display of the pertinent data.

1. Is there a significant difference in the average age of the co-op and non co-op students the first time they enrolled at MCCC?

The minimum age of students when they first enrolled was 18 years of age for the co-op and non co-op groups. The oldest first time enrolled co-op student was 29 years of age. For the non co-op group the oldest first time enrolled student was 49 years of age. In order to determine any statistical significance between the average ages of the two groups, a t-test was employed.

As seen in Table 1 the difference between the average ages of co-op and non co-op students when they first enrolled is highly significant.

TABLE 1

Analysis of Ages of Co-op and Non Co-op Students When They First Enrolled at MCCC

| Group | N | Variance | Mean Age |
|---|---|---|---|
| Co-op Students | 63 | 8.91 | 19.9 |
| Non Co-op Students[1] | 67 | 73.74 | 25.0 |
| | | | t = -4.487* |

[1]Age was missing for two cases.

*significant at .001 level

The lower average age for the co-op group may have influenced some previously reported data. Tables 8 and 13 from the first report included the facts that the co-op students reported:

1. only 19 percent had program related previous work experience
2. only 12 percent enrolled at MCCC for job upgrading.

The non co-op group's average age of 25 may account for the fact almost one-third of the group had the program related job experience or enrolled at Macomb for job upgrading.

2. Are former co-op students more apt to be employed in program related jobs than are former non co-op students?

In order to answer this question a Chi-Square ($\chi^2$) was calculated to test the independence of the variables.

Table 2 indicates that the co-op students who are men are indeed more likely to obtain program related jobs because the $\chi^2$ value is significant at the .002 level. This means that securing a program job is not merely by chance. Participation in co-op seems to influence this aspect of employment.

TABLE 2

Chi-Square Test Between Group and Program Related Employment for the Men Students

| Group | N | Test Statistic |
|---|---|---|
| Co-op | 49 | $\chi^2 = 9.3016$* |
| Non Co-op | 55 | |

*significant at .002 level

On the other hand, the co-op experience does not appear to have the same effect for the women students. The significance level of the $\chi^2$ value is .50, meaning that there is an equal possibility for the women students to have a program related job whether or not they participated in co-op.

Table 3 presents this information.

TABLE 3

Chi-Square Test Between Group and Program Related Employment for the Women Students

| Group | N | Test Statistic |
|---|---|---|
| Co-op | 9 | $\chi^2 = .4444$* |
| Non Co-op | 3 | |

*significant at .5 level

Program completion (graduation) as an influencing agent in obtaining a program related job was considered. Tables 4 and 5 display the results of the $\chi^2$ analyses for the co-op and non co-op groups.

TABLE 4

Test of Independence of Graduation and Program Related Employment for Co-op Students

| Graduates | Test Statistic |
|---|---|
| 58 | $\chi^2 = .6987$* |
| Program Related Employment | |
| 44 | |

*significant at .4 level

TABLE 5

Test of Independence of Graduation and Program Related Employment for Non Co-op Students

| Graduates | Test Statistic |
|---|---|
| 19 | $\chi^2 = 2.248$* |
| **Program Related Employment** | |
| 27 | |

*significant at .6 level

Graduation has little statistical significance on the ability to get a program related job for either group. The actual participation in the co-op option influenced program related employment more than did the fact of graduation.

3. Do co-op students complete more technical courses at MCCC than non co-op students?

Co-op students in the study completed from one to 23 technical courses. The average number of courses was calculated as 11. The range of completed technical courses for the non co-op group was zero to 25 with an average of 8 courses per student. Table 6 shows the results of the t-test used to discover any statistical significance to the different mean number of completed courses.

TABLE 6

Analysis of the Average Number of Technical Courses Completed at MCCC by the Co-op and Non Co-op Students

| Group | N | Variance | Average Number Tech Courses |
|---|---|---|---|
| Co-op | 63 | 19.06 | 11.06 |
| Non Co-op | 69 | 40.21 | 5.29 |
| | | F = 2.11* | t = 2.90* |

*significant at .01 level

It is obvious that co-op students successfully complete more technical courses than do the non co-op students. This may also have some positive influence on the ability of the co-op student to secure program related employment.

4. Do co-op students earn more credit hours at MCCC than do non co-op students?

The answer to this question was obtained from the transcripts. The co-op student group minimum number of earned hours was ten and the maximum number was 99. For the non co-op group the minimum was found to be three and the maximum was 98. However, the average number of earned hours varied considerably for the two groups. Table 7 displays the difference and indicates that the co-op group averages a significantly greater number of credit hours earned at Macomb. This information continues the trend of the co-op student being oriented toward completing the degree program.

TABLE 7

Analysis of the Average Number of Credit Hours Earned at MCCC by the Co-op and Non Co-op Students

| Group | N | Variance | Average Number Credit Hours Earned |
|---|---|---|---|
| Co-op | 63 | 320.88 | 62.27 |
| Non Co-op[1] | 65 | 708.70 | 42.66 |
| | | F = 2.21* | t = 4.87* |

[1]Four students earned no hours at Macomb.

*significant at .01 level

5. Do co-op students have a significantly higher final G.P.A. than do the non co-op students?

Table 8 presents the results of the t-test used to determine whether or not there is a significant difference between the average final G.P.A. of the co-op and non co-op groups. In fact, there is. The co-op group has a substantially higher average G.P.A. (3.08) than the 2.53 average G.P.A. of the non co-op group. It is evident that co-op students receive better grades in their college courses.

TABLE 8

Analysis of Final G.P.A.'s of Co-op and Non Co-op Students

| Group | N | Variance | Mean G.P.A. |
|---|---|---|---|
| Co-op | 63 | .224 | 3.08 |
| Non Co-op | 69 | .834 | 2.53 |
| | | F = 3.72* | T = 4.261* |

*significant at .001 level

6. Do the co-op graduates have a significantly higher final G.P.A. than do the co-op non graduates?

Table 9 shows a rather surprising fact - the co-op non graduates have a higher final G.P.A. than the co-op graduates. However, the .14 difference has no statistical significance.

TABLE 9

Analysis of Final G.P.A.'s for Co-op Graduates and Non Graduates

| Group | N | Variance | Average Final G.P.A. |
|---|---|---|---|
| Graduates | 47 | .207 | 3.04 |
| Non Graduates | 16 | .276 | 3.18 |
| | | F = 1.337 | t = -1.019 |

significance = .31

7. Do the non co-op graduates have a significantly higher final G.P.A. than do the non co-op non graduates?

Table 10 indicates a difference between the two groups using the final G.P.A. as a point of comparison. The non co-op graduate group's average final G.P.A. (3.07) is significantly higher than the 2.27 final G.P.A. of the non graduate group.

TABLE 10

Analysis of Final G.P.A.'s for Non Co-op Graduates and Non Graduates

| Group | N[1] | Variance | Average Final G.P.A. |
|---|---|---|---|
| Graduates | 21 | .152 | 3.07 |
| Non Graduates | 45 | .958 | 2.27 |
| | | F = 6.312 | t = 3.592* |

[1]The fact of graduation was unknown for three respondents.

*significant at .001 level

8. Is there a significant difference in the G.P.A. before and after the co-op experience for the co-op student?

In order to determine any differences in grades, the G.P.A. was calculated for courses taken prior to the first co-op term. Then the G.P.A. for all courses taken after the first co-op term was determined. All grades and credit hours for the Co-op Seminar classes (I.C.I. 250) were deleted from the calculations. Table 11 presents the results of the t-test for correlated means. It is obvious that no statistical significance exists for the difference between grades received before and after the co-op experience for this group.

TABLE 11

Analysis of G.P.A. of Co-op Students Before and After the First Co-op Experience (I.C.I. grades excluded)

| Variable | N | Mean G.P.A. | Standard Deviation |
|---|---|---|---|
| G.P.A. Before | 63 | 2.84 | 1.035 |
| G.P.A. After | 63 | 2.94 | |
| | | | t = -.754 |

significance = .45

9. Do the grades received in the co-op seminar course significantly influence the final G.P.A.'s of the co-op students?

In order to answer this question manipulation of the information from the co-op students' transcripts was necessary. The final G.P.A. was taken from the transcripts of each co-op student. Then a final G.P.A. without the grades for the co-op seminar class (I.C.I. 250) was calculated for each co-op student. A t-test was then used to discuss whether or not there was a significant difference between the mean values of the two variables, Table 12 shows that there is a significant difference at the .003 level. Therefore, it is apparent that the grades from the seminar course influence the actual final G.P.A. for co-op students.

TABLE 12

Analysis of the Co-op Students' Final G.P.A.'s With and Without the Seminar Grades

| Variable | Mean | Standard Deviation |
|---|---|---|
| Final G.P.A. | 3.08 | .268 |
| G.P.A. Without Seminar Grades | 2.97 | t = 3.057* |

*significant at .003 level

Because this question of the seminar course was considered, three additional points are presented. During the data gathering and analyses aspects of this study the following items were produced:

1. The average number of seminar course credit hours taken by the co-op students was 9.5 hours. The minimum number was zero and the maximum was 18 hours.

2. The average G.P.A. received by students for those seminar credit hours was 3.8. The minimum G.P.A. was zero and the maximum was 4.0.

3. The average number of semesters of the seminar course (co-op assignments) was 2.1. The minimum was zero and the maximum was 4.

Those characteristics had an impact on the outcome of the data reported on Table 12.

10. Are final G.P.A.'s for co-op students who continued employment with the co-op company significantly higher than the final G.P.A. for those who changed the place of their employment?

TABLE 13

Analysis of Final G.P.A.'s for Students in a Specific Category

| Group | N | Variance | Mean G.P.A. |
|---|---|---|---|
| With Co-op Company | 24 | .241 | 3.04 |
| Not at Co-op Company | 39 | .219 | 3.10 |
| | | | t = -.450* |

*significant at .65 level

Table 13 (above) shows that the group who changed the place of employment has a .06 higher final G.P.A. than the group who did remain employed with the co-op company. However, the difference did not achieve any statistical significance.

11. Are there any significant differences between the respondents to the first and second mailings?

The flexibility of the computer program made a comparison between respondents of the first mailing and second mailing possible.

The $\chi^2$ test was run on the co-op graduates from the mailings. It was found that there was no significant difference in the number who were graduates. There was also no significant difference in the number of non co-op graduates who responded to the first or second mailings as discovered in a $\chi^2$ analysis.

A $\chi^2$ test was then run on the number of co-op respondents who have program related jobs. There is no statistically significant difference between the first and second mailing respondents and the fact of program related employment. The non co-op group also showed no significant difference in that category.

The information used in determining the answer to this question is useful in that it shows that the respondents to the separate mailings were similar. This is not only informative but adds to the reliability of the sampling techniques and other procedures used during this study.

CHAPTER IV

DISCUSSION

The purpose of this chapter is to expand some points illustrated by the previous chapter. Data reported in various categories were reorganized and included in this section.

The following series of four tables provides some comparisons of co-op students and non co-op students using graduation and program related employment as the bases. The data may be useful in the development of student profiles and description of certain characteristics.

TABLE 14

Description of Co-op Students Using Graduation Status as a Base

| Category | Graduates N=47 Mean | Non-Graduates N=16 Mean |
|---|---|---|
| Average Age First Enrolled | 20.13 | 19.3 |
| Average Number of Credit Hours Earned | 65.4 | 53.2 |
| Average Number of Technical Courses Completed | 11.8 | 8.8 |
| Average Final G.P.A. | 3.04 | 3.18 |
| Average G.P.A. With No Co-op Seminar Grades | 2.95 | 3.03 |
| Average G.P.A. of Co-op Seminar | 3.87 | 3.69 |
| Average Number of Credit Hours of Co-op | 9.4 | 9.7 |

TABLE 15

Description of Non Co-op Students
Using Graduation Status as a Base[1]

| Category | Graduates N=21 Mean | Non-Graduates N=45 Mean |
|---|---|---|
| Average Age First Enrolled | 25.6 | 24.7 |
| Average Number of Credit Hours Earned | 65.6 | 31.0 |
| Average Number of Technical Courses Completed | 13.7 | 5.6 |
| Average Final G.P.A. | 3.07 | 2.27 |

[1]The graduation status is unknown for three respondents.

TABLE 16

Description of Co-op Students Using
Program Related Employment as a Base[1]

| Category | Program Related Job N=44 Mean | Non-Program Related Job N=14 Mean |
|---|---|---|
| Average Age First Enrolled | 20.3 | 19.4 |
| Average Number of Credit Hours Earned | 65.2 | 51.6 |
| Average Number of Technical Courses Completed | 11.8 | 9.2 |
| Average Final G.P.A. | 3.08 | 3.14 |
| Average G.P.A. With No Co-op Seminar Grades | 3.00 | 3.00 |
| Average G.P.A. of Co-op Seminar | 3.94 | 3.71 |
| Average Number of Credit Hours of Co-op | 10.2 | 7.29 |

[1]This base was unavailable for five respondents.

TABLE 17

Description of Non Co-op Students Using Program Related Employment as a Base[1]

| Category | Program Related Job N=29 Mean | Non Program Related Job N=29 Mean |
|---|---|---|
| Average Age First Enrolled | 25.14 | 23.1 |
| Average Number of Credit Hours Earned | 41.9 | 40.3 |
| Average Number of Technical Courses Completed | 9.7 | 6.8 |
| Average Final G.P.A. | 2.76 | 2.42 |

[1]This base was unavailable for eleven respondents.

The fact that the average age of co-op students when they enrolled for the first time (19.9 yrs.) is significantly lower than the corresponding age for non co-op students (25.0 yrs.) lends itself to speculations. The younger co-op student has little previous experience in areas presented by the technical programs. Grasping theory may be more difficult without the background to use as a point of reference. Also, the student may use college services more than the older student.

Participation in co-op was determined to be more influential in a student's ability to secure a program related job than his actual graduation from a program.

The co-op student also successfully completed more technical courses than non co-op students. The average co-op student completed about 11 technical courses. Along with the completion of technical courses, the number of credit hours earned by the students is interesting. The graduates, both co-op and non co-op, earned the same

average number of credit hours (65). The difference occurs when the non graduates from both groups are considered. The co-op non graduate earned an average of 53 credit hours and the non co-op non graduate earned an average of 31 credit hours. These findings are noteworthy especially when the issues of retention and institutional planning are considered.

The lack of a significant improvement in G.P.A. after a student participated in the co-op option and the positive influence the co-op seminar course exerted on the final G.P.A. are striking facts revealed by the data analyses. It is not the prerogative of this report to conjecture possible reasons for the reported phenomena. The results of the statistical analyses of the data stand on their own.

Throughout the entire series of reports there is evidence that students who had participated in the co-op option at MCCC are on the more favorable side of most questions. This in itself poses further questions. For example:

1. What are some characteristics of students who choose to participate in the co-op option at MCCC?
2. Are the co-op students more goal oriented and/or motivated than other students in the same programs?

Resolving those issues would entail further investigation and are beyond the scope of this particular design.

This study amply provided data for future administrative decision making and offered documented arguments for encouraging students to pursue the program.

## CHAPTER V

## SUMMARY

This report compared selected characteristics and the academic performance of a sample of co-op and non co-op respondents to a survey. The data, secured from transcripts and survey instruments, were used to provide the following answers to the posed questions:

1. Yes, there is a significant difference in the average age of the co-op students (19.9 yrs.) and the non co-op students (25 yrs.) the first time they enrolled at MCCC.

2. Co-op students who are men are more apt to be employed in program related jobs than are their non co-op counterparts. No such difference is evident for women students.

3. Co-op students complete significantly more ($p < .01$) technical courses at MCCC than do non co-op students.

4. Co-op students earn significantly more ($p < .01$) credit hours at MCCC than do non co-op students.

5. Co-op students have significantly ($p < .001$) higher final G.P.A.'s than do the non co-op students.

6. The co-op graduates do not have a higher final G.P.A. than do the co-op non graduates. In fact the co-op non graduates' mean final G.P.A. of 3.18 was .14 higher than the graduates mean final G.P.A. of 3.04.

7. The non co-op graduates have a significantly ($p < .001$) higher final G.P.A. than do the non co-op non graduates.

8. There is no significant difference in the G.P.A. before and after the co-op experience for the co-op student.

9. The grades received in the co-op seminar course (ICI 250) do significantly ($p < .003$) influence the final G.P.A.'s of the co-op students.

10. Final G.P.A.'s for co-op students who continued employment with the co-op company are not significantly higher than the final G.P.A.'s for those who changed their place of employment.

11. There are no significant differences between the respondents to the first and second mailings.